Claim Status

1. (original) A rework process for removing an imaging layer from a substrate stack, the stack comprising a substrate, an underlayer adjacent to said substrate, and an imaging layer comprising silicon adjacent to said underlayer, said process comprising the steps of:

(a) contacting said substrate stack with an imaging layer removal solvent;
(b) removing said imaging layer with said imaging layer removal solvent thereby forming a substrate/underlayer stack, wherein said imaging layer removal solvent is selected from the group consisting of: glycol ethers, ketones, esters, lactates, dimethylsulfoxide (DMSO), dimethylformamide (DMF), tetrahydrofuran (THF), methyl tetrahydrofuran, dioxane, tetrahydropyran, ethyl tetrahydropyran-4-acetate, methyl tetrahydropyran-4-methanol, tetrahydropyran-4-one, n-butyl acetate, n-amyl acetate, and any combinations thereof; and
(c) removing said imaging layer removal solvent from said substrate/underlayer stack after said imaging layer is removed.

2. (original) The rework process of claim 1, wherein said substrate is selected from the group consisting of: silicon, nitrides, oxides, oxynitrides, inorganic derivatives of silicon, coatings of nitrides, metals, low k dielectric coatings, copper, aluminum, tungsten, low-k organic materials, carbon-doped silicon, carbon-doped oxide, and any combinations thereof.

3. (original) The rework process of claim 1, wherein said underlayer is one or more organic films.

4. (original) The rework process of claim 1, wherein said imaging layer is a chemically amplified photoresist.

5. (original) The rework process of claim 1, wherein said imaging layer on said substrate stack has not been exposed to radiation.

6. (original) The rework process of claim 1, wherein said imaging layer on said substrate stack has been exposed to a radiation source and a developer.

7. (original) The rework process of claim 1, wherein said imaging layer removal solvent is selected from the group consisting of: ketones, esters, 2-heptanone, methyl propyl ketone, PGME, PGMEA, ethyl lactate, cyclohexanone, n-butyl acetate, tetrahydrofuran, methyl tetrahydrofuran, glycol mono ethers, and any combinations thereof.

8. (original) The rework process of claim 1, wherein said imaging layer removal solvent is selected from the group consisting of: 2-heptanone, cyclohexanone, n-butyl acetate, PGME, PGMEA, ketone mixtures where the ketone comprises greater than 50% of the imaging layer removal solvent, glycol mono ether solvent where the glycol mono ether solvent comprises greater than 50% of the imaging layer removal solvent, ternary or higher mixtures of ketones, glycol mono ethers, and glycol monoether esters, and any combinations thereof.

9. (original) The rework process of claim 1, wherein said imaging layer removal solvent is selected from the group consisting of: 2-heptanone, cyclohexanone, n-butyl acetate, PGME, PGMEA, a solvent mixture comprising about 70% to about 90% ketone and about 10% to about 30% lactate, a solvent mixture comprising about 70% to about 95% glycol monoether and 5% to about 30% lactate, a solvent mixture comprising about 50% to about 70% glycol monoether, about 1% to about 20% ketone, and about 5% to about 35% glycol monoether ester, and any combinations thereof.

10. (original) The rework process of claim 1, wherein the contacting step of step (a) is carried out by a means selected from the group consisting of: immersion, disposition on a track, and any combination thereof.

11. (original) The rework process of claim 10, wherein said contacting means is disposition on a track and said substrate stack has an orientation selected from the group consisting of: parallel, perpendicular, or angled with respect to a floor.

12. (original) The rework process of claim 11, wherein said imaging layer removal solvent is applied by a method selected from the group consisting of: streaming, spraying, and any combination thereof.

13. (original) The rework process of claim 11, wherein said substrate stack is rotating on said track, static on said track, and any combination thereof.

14. (original) The rework process of claim 1, wherein said imaging layer removal solvent contacts said imaging layer for about 30 seconds to about 5 minutes.

15. (original) The rework process of claim 1, wherein said imaging layer removal solvent has a temperature between about 18°C to about 25°C.

16. (original) The rework process of claim 1, wherein said removal step of step (c) comprises a means selected from the group consisting of: spinning, rinsing, and any combinations thereof.

17. (original) The rework process of claim 16, wherein said spinning means comprises spinning said substrate/underlayer stack at about 1000 rpm to about 5000 rpm for about 10 seconds to about 120 seconds.

18. (original) The rework process of claim 16, wherein said rinsing means comprises water rinsing, additional imaging layer removal solvent rinsing, or any combinations thereof.

19. (original) The rework process of claim 1, further comprising after step (c), a step of removing any residual water, residual solvent, and combinations thereof from the substrate/underlayer stack by a means selected from the group consisting of: spin drying, ambient air drying, baking, flowing a gas over a surface of said stack, and any combinations thereof.

20. (original) The rework process of claim 19, wherein said baking means is selected from the group consisting of: oven baking, hot plate baking, infrared baking, and any combinations thereof.

21. (original) The rework process of claim 20, wherein said baking is carried out at a temperature between about 100°C and 205°C.

22. (original) A lithographic imaging rework process for correcting one or more defects on an imaging layer on a substrate stack, said substrate stack comprising a substrate, an underlayer adjacent to said substrate, and an imaging layer comprising silicon adjacent to said underlayer, said process comprising the steps of:

(a) contacting said substrate stack with an imaging layer removal solvent selected from the group consisting of: glycol ethers, ketones, esters, lactates, dimethylsulfoxide (DMSO), dimethylformamide (DMF), tetrahydrofuran (THF), methyl tetrahydrofuran, dioxane, tetrahydropyran, ethyl tetrahydropyran-4-acetate, methyl tetrahydropyran-4-methanol, tetrahydropyran-4-one, n-butyl acetate, n-amyl acetate, and any combinations thereof;

(b) removing said imaging layer with said imaging layer removal solvent, thereby forming a substrate/underlayer stack;

(c) removing said imaging layer removal solvent from said substrate/underlayer stack after said imaging layer is removed;

(d) coating said substrate/underlayer stack with a new imaging layer;

(e) exposing said new imaging layer to radiation; and

(f) developing said new imaging layer.

23. (original) The lithographic imaging rework process of claim 22, wherein said substrate is selected from the group consisting of: silicon, nitrides, oxides, oxynitrides, inorganic derivatives of silicon, coatings of nitrides, metals, low k dielectric coatings, low-k organic material, copper, aluminum, tungsten, carbon-doped oxide, carbon-doped silicon, and any combinations thereof.

24. (original) The lithographic imaging rework process of claim 22, wherein said underlayer is one or more organic films.

25. (original) The lithographic imaging rework process of claim 22, wherein said imaging layer is a chemically amplified photoresist.

26. (original) The lithographic imaging rework process of claim 22, wherein said imaging layer on said substrate stack has not been exposed to radiation.

27. (original) The lithographic imaging rework process of claim 22, wherein said imaging layer on said substrate stack has been exposed to a radiation source and a developer.

28. (original) The lithographic imaging rework process of claim 22, wherein said imaging layer removal solvent is selected from the group consisting of: ketones, esters, 2-heptanone, methyl propyl ketone, PGME, PGMEA, ethyl lactate, cyclohexanone, n-butyl acetate, tetrahydrofuran, methyl tetrahydrofuran, glycol mono ethers, and any combinations thereof.

29. (original) The lithographic imaging rework process of claim 22, wherein said imaging layer removal solvent is selected from the group consisting of: 2-heptanone, cyclohexanone, n-butyl acetate, PGME, PGMEA, ketone mixtures where the ketone comprises greater than 50% of the imaging layer removal solvent, glycol mono ether solvent where the glycol mono ether solvent comprises greater than 50% of the imaging layer removal solvent, ternary or higher mixtures of ketones, glycol mono ethers, and glycol monoether esters, and any combinations thereof.

30. (original) The lithographic imaging rework process of claim 22, wherein said imaging layer removal solvent is selected from the group consisting of: 2-heptanone, cyclohexanone, n-butyl acetate, PGME, PGMEA, a solvent mixture comprising about 70% to about 90% ketone and about 10% to about 30% lactate, a solvent mixture comprising about 70% to about 95% glycol monoether and 5% to about 30% lactate, a solvent mixture comprising about 50% to about 70% glycol monoether, about 1% to about 20% ketone, and about 5% to about 35% glycol monoether ester, and any combinations thereof.

31. (original) The lithographic imaging rework process of claim 22, wherein said contacting step of step (a) is carried out by a means selected from the group consisting of: immersion, disposition on a track, and any combination thereof.

32. (original) The lithographic imaging rework process of claim 31, wherein said contacting means is disposition on a track and said substrate stack has an orientation selected from the group consisting of: parallel, perpendicular, or angled with respect to a floor.

33. (original) The lithographic imaging rework process of claim 32, wherein said imaging layer removal solvent is applied by a method selected from the group consisting of: streaming, spraying, and any combination thereof.

34. (original) The lithographic imaging rework process of claim 32, wherein said substrate stack is rotating on said track, static on said track, and any combination thereof.

35. (original) The lithographic imaging rework process of claim 22, wherein said imaging layer removal solvent contacts said imaging layer for about 30 seconds to about 5 minutes.

36. (original): The lithographic imaging rework process of claim 22, wherein said imaging layer removal solvent has a temperature between about 18°C to about 25°C.

37. (original) The lithographic imaging rework process of claim 22, wherein said removal step of step (c) comprises a means selected from the group consisting of: spinning, rinsing, and any combinations thereof.

38. (original) The lithographic imaging rework process of claim 37, wherein said spinning means comprises spinning said substrate/underlayer stack at about 1000 rpm to about 5000 rpm for about 10 seconds to about 120 seconds

39. (original) The lithographic imaging rework process of claim 37, wherein said rinsing means comprises water rinsing, additional imaging layer removal solvent rinsing, and any combinations thereof.

40. (original) The lithographic imaging rework process of claim 22, further comprising after step (c), a step of removing any residual water, residual solvent, and combinations thereof from the substrate/underlayer stack.

41. (original) The lithographic imaging rework process of claim 40, wherein said residual water, residual solvent, and any combination thereof is removed from said substrate/underlayer stack by a means selected from the group consisting of: spin drying, ambient air drying, baking, flowing of a gas over a surface of said stack, and any combinations thereof.

42. (original) The lithographic imaging rework process of claim 41, wherein said baking means is selected from the group consisting of: oven baking, hot plate baking, infrared baking, and any combinations thereof.

43. (original) The rework process of claim 42, wherein said baking is carried out at a temperature between about 100°C and 205°C.

44. (original) The lithographic imaging rework process of claim 22, wherein said new imaging layer comprises silicon.

45. (original) The lithographic imaging rework process of claim 22, further comprising, after step (d), the step of baking said new imaging layer.

46. (original) The lithographic imaging rework process of claim 45, wherein said baking step is carried out for between about 30 seconds to about 120 seconds.

47. (original) The lithographic imaging rework process of claim 45, wherein said baking step is done at a temperature between about 90°C to about 150°C.

48. (original) The lithographic imaging rework process of claim 22, wherein said new imaging layer is exposed imagewise, in step (e).

49. (original) The lithographic imaging rework process of claim 22, wherein said radiation is derived from a radiation source selected from the group consisting of: high pressure mercury lamp, KrF excimer laser, ArF excimer laser, electron beam, x-ray, and any combinations thereof.

50. (original) The lithographic imaging rework process of claim 22, wherein said radiation has a wavelength of about 248 nm or less.

51. (original) The lithographic imaging rework process of claim 50, wherein said radiation has a wavelength of 193 nm or 248 nm.

52. (original) The lithographic imaging rework process of claim 22, further comprising, after step (e), the step of baking said exposed new imaging layer.

53. (original) The lithographic imaging rework process of claim 52, wherein said baking step is carried out for between about 5 seconds to about 300 seconds.

54. (original) The lithographic imaging rework process of claim 53, wherein said baking step is done at a temperature between about 50°C to about 150°C.

55. (original) The lithographic imaging rework process of claim 22, wherein said developing step (f) comprises the use of an aqueous alkaline solution developer.

56. (original) The lithographic imaging rework process of claim 55, wherein said aqueous alkaline solution developer comprises aqueous solutions selected from the group consisting of: alkali metal silicates, phosphates, hydroxides, carbonates, tetra alkylammonium hydroxides, tetramethylammonium hydroxide (TMAH), and any combinations thereof.

57. (original) A rework process for removing an imaging layer from a substrate stack, said stack comprising a substrate, an underlayer adjacent to said substrate, and an imaging layer comprising silicon adjacent to said underlayer, said process comprising the steps of:

(a) contacting said substrate stack with an imaging layer removal solvent;
(b) removing said imaging layer with said imaging layer removal solvent thereby forming a substrate/underlayer stack, wherein said imaging layer removal solvent is selected from the group consisting of: glycol ethers, ketones, esters, lactates, dimethylsulfoxide (DMSO), dimethylformamide (DMF), tetrahydrofuran (THF), methyl tetrahydrofuran, dioxane, tetrahydropyran, ethyl tetrahydropyran-4-acetate, methyl tetrahydropyran-4-methanol, tetrahydropyran-4-one, n-butyl acetate, n-amyl acetate, and any combinations thereof;
(c) rinsing said imaging layer removal solvent from said substrate/underlayer stack with a rinse solution after said imaging layer is removed; and
(d) baking said substrate/underlayer stack to remove said rinse solution.

58. (original) The rework process of claim 57, wherein said substrate is selected from the group consisting of: silicon, nitrides, oxides, oxynitrides, inorganic derivatives of silicon, coatings of nitrides, metals, low k dielectric coatings, low-k organic material, copper, aluminum, tungsten, carbon-doped oxide, carbon-doped silicon, and any combinations thereof.

59. (original) The rework process of claim 57, wherein said underlayer is one or more organic films.

60. (original) The rework process of claim 57, wherein said imaging layer is a chemically amplified photoresist.

61. (original) The rework process of claim 57, wherein said imaging layer on said substrate stack has not been exposed to radiation.

62. (original) The rework process of claim 57, wherein said imaging layer on said substrate stack has been exposed to a radiation source and a developer.

63. (original) The rework process of claim 57, wherein said imaging layer removal solvent is selected from the group consisting of: ketones, esters, 2-heptanone, methyl propyl ketone, PGME, PGMEA, ethyl lactate, cyclohexanone, n-butyl acetate, tetrahydrofuran, methyl tetrahydrofuran, glycol mono ethers, and any combinations thereof.

64. (original) The rework process of claim 57, wherein said imaging layer removal solvent is selected from the group consisting of: 2-heptanone, cyclohexanone, n-butyl acetate, PGME, PGMEA, ketone mixtures where the ketone comprises greater than 50% of the imaging layer removal solvent, glycol mono ether solvent where the glycol mono ether solvent comprises greater than 50% of the imaging layer removal solvent, ternary or higher mixtures of ketones, glycol mono ethers, and glycol monoether esters, and any combinations thereof.

65. (original) The rework process of claim 57, wherein said imaging layer removal solvent is selected from the group consisting of: 2-heptanone, cyclohexanone, n-butyl acetate, PGME, PGMEA, a solvent mixture comprising about 70% to about 90% ketone and about 10% to about 30% lactate, a solvent mixture comprising about 70% to about 95% glycol monoether and 5% to about 30% lactate, a solvent mixture comprising about 50% to about 70% glycol monoether, about 1% to about 20% ketone, and about 5% to about 35% glycol monoether ester, and any combinations thereof.

66. (original) The rework process of claim 57, wherein said rinsing step (c) comprises rinsing said substrate/underlayer stack with water, additional imaging layer removal solvent, or any combinations thereof.

67. (original) The rework process of claim 57, wherein said baking step (d) comprises a baking means selected from the group consisting of: oven baking, hot plate baking, infrared baking, and any combinations thereof.

68. (original) The rework process of claim 57, wherein said baking step (d) is carried out at a temperature between about 100°C to about 205°C.